

HAMILTON (Geo.)

On the relation of sewer-gas  
to typhoid fever

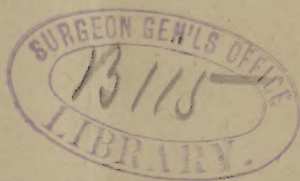
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*To Dr. H. C. Wood -  
with the respects of Gen. Hamilton.*

ON THE RELATION OF SEWER GAS TO  
TYPHOID FEVER.

By  
GEORGE HAMILTON, M.D.

[Read March 5, 1879.]



THE subject of the paper for this evening cannot but be regarded as one of much importance, as well in relation to medicine as in reference to the public at large. As you are all aware, the attention of the community, in general, has for a few years past been drawn in an unusual degree to the subject of sewer gas as an agent in the production of typhoid fever, and recently it has been declared by several writers to be the most potent and common cause, not only of this fever, but also of scarlet fever, and, in a special degree, of diphtheria. As a consequence of these declarations, a feeling of anxiety and alarm has manifested itself, greatly disproportionate to what an unbiassed and calm consideration of the subject will admit, or an examination of the reports of the Board of Health will justify. That those members of our profession who have endeavored, so earnestly and persistently, to impress upon the mind of the public, as well as of the practitioner, that sewer gas is the most potent and common cause of typhoid fever in Philadelphia, have acted conscientiously, no one need doubt. To their excellent standing in the profession, and to their zeal in promulgating the views alluded to, is, in



great measure, due the success that has attended their efforts in this direction. So successful, in fact, have these efforts proven that probably one-half of the profession in this city, and a still larger proportion of the citizens who may have given some attention to this subject, have been induced to accept the views so urgently pressed as a finality. It is, however, to be remembered that very little in opposition to the opinions stated has been attempted, and it may be that the present will prove a futile effort to stem the actual current of professional and popular feeling upon this subject. Nevertheless, we feel quite assured that a large majority of practitioners who have had, at the bedside of patients, the most frequent and abundant opportunities for the study of typhoid fever, will reject the evidence hitherto offered to prove that sewer gas is the most potent and common cause of typhoid fever in Philadelphia, or elsewhere, as utterly untenable, and as in direct antagonism with the facts and figures pertaining to that malady.

An observation or two, in reference to the more acute aspect of disease as it occurs in the country, compared with what is seen in city practice, may here be admitted, bearing more or less directly upon the subject before us. The late Dr. Joseph Parrish, eminent in citizenship and as a practitioner, when lecturing, in 1830, before a summer class of students upon bilious remittent fever, narrated his sad experience of this disease, as witnessed in consultation with country physicians within a circuit of about seven miles of the city (sometimes in Pennsylvania, at other times in New Jersey), by declaring that, in frequency in proportion to population, and in violence and fatality, it

greatly exceeded anything he had ever met with in Philadelphia. The same remark was made by him in regard to dysentery, and was fully verified by the writer when, a few years later, he began practice thirty miles distant from the city. The accounts received from time to time from country physicians regarding the disastrous epidemics of the diseases mentioned, and, in an especial degree, of diphtheria, are doubtless familiar to you.

Some statements, made by the writer during the discussion that followed the delivery of the paper of Dr. Keating upon the relation of sewer gas to typhoid fever, must here be repeated, as some who are now present may have then been absent. Centreville, my location in the country for more than ten years, was upon the ridge separating the Brandywine and Red Clay Creeks; distant seven miles from Wilmington, seven from Kennet Square, four from Dupont's, and eleven from West Chester. The surrounding country, rolling or hilly, abounded in nearly every direction with springs of fine water. In this rural section began my first bedside experience in typhoid fever, and the occurrence in my practice of four cases of intestinal perforation, in the space of twelve consecutive months, may but too well attest the character of the prevailing epidemic. It was not, however, until after five years' practice in this vicinity that typhoid fever developed itself; the usual form of fever in earlier years of practice having been bilious remittent, which, like the typhoid, at times assumed an epidemic character, and proved nearly as fatal as typhoid, while in other seasons but few cases occurred, the local conditions remaining essentially the same from year to year.



The change from bilious remittent to typhoid fever was, naturally enough, not abrupt, some of the symptoms of the former gradually giving place to those of the latter. In mode of progression there was a close resemblance between them; either disease showing itself upon an elevated plain, on the brow or slope of a hill, or in the vale below, with perhaps a slight preference for the latter; while the mansion of the opulent farmer would, in turn, be visited with the home of the humble cottager.

Two remarkable instances of typhoid fever, mentioned in the discussion before alluded to, cannot, for the reason then assigned, be passed in silence. One occurred in the residence of a wealthy farmer, the family consisting of eight persons, of whom only one, the mother, escaped an attack. Six were severely affected—three of them dangerously—while the seventh, a colored servant, suffered but slightly. Now the important point in the history of these cases is revealed in the fact that the disease did not originate upon the premises. A son, about nineteen years of age, had been absent several weeks on business in Maryland, forty miles distant from his father's residence, and from thence was brought home sick, and, apparently from contagion, the others were in turn affected, giving rise to an attendance of nearly four months before the final recovery of the last patient. The second instance happened in a family of seven persons, four or five of whom were attacked; the death of a youth of eighteen years resulting from perforation. Here, again, the disease did not originate on the premises; the mother, the first patient, who had been assisting in nursing a relative several

miles distant, was brought back to her own home suffering from typhoid fever, contracted apparently from that relative. The number of persons attacked in both of these examples was exceptionally large, yet the disease rarely appeared in a family, even of moderate size, without more than one of its members being affected.

As to the origin of these widely diffused, destructive epidemics, nothing could be said in explanation except that, as a rule, a warm, moist spring, and, as a sequence, excessive growth of vegetation, followed by a hot, dry summer, appeared to favor the development of typhoid; just as had been noticed in former seasons in regard to bilious fever. In relation to the influence of local conditions, it may be said that in an old, long cultivated section, changes in these conditions rarely occur, and certainly nothing of this kind did occur that could explain the ravages of fever in one year and its absence or slight character the next; and hence the physicians of that section, so far as I knew, were nearly of one accord in regarding atmospheric, hygrometric, electric, or telluric conditions as the sources of the presence or absence, and of the violence or mildness, of the epidemic.

On returning to the city, thirty-three years ago, a location for practice was chosen at Sixteenth and Summer Streets, and has thus continued ever since. At that remote period, intermittent, remittent and typhoid fever prevailed to a considerable extent, especially between Broad Street and the Schuylkill. Not one of these types can now be seen so often, in proportion to population, as during the earlier years of my practice in this locality.



Some years after returning to the city, Professor J. K. Mitchell was called to consult with the late Dr. Gebhard and myself in a severe case of typhoid fever near my residence. This was at a period when bilious remittent was being gradually supplanted by typhoid fever. Dr. Mitchell then stated to us that nearly all the cases of this disease seen by him were in consultations upon the suburbs of the city, as in the case in which he met us, for at that time the locality was but a suburb; yet, in the suburbs at that period there were but few sewers or cesspools, and, as to water-closets, they were not to be found there; whilst on the contrary, in his own vicinity (Eleventh and Walnut Streets) they existed in all directions, and yet, as he informed Dr. Gebhard and myself, he scarcely ever saw typhoid fever in the families under his immediate care. Again, the late Dr. Wm. W. Gerhard, prominent as an authority in typhoid fever, informed me, about six years before his death, that he no longer regarded typhoid fever as either so prevalent or so fatal in this city as it had been in former years; that some modification of the disease, from unknown causes, had occurred, just as he had witnessed many years previously in Paris, where typhoid fever in some of the hospitals had gradually changed in character until, from a mortality of one in three patients, only one case out of seventeen attacked terminated fatally. With the statements and opinions thus expressed my own observations and experience fully accord.

During thirty-three years of practice in the city, four cases of typhoid fever, occurring in one family, have come under my care; in two or three families, two persons in each have been affected; yet, setting



these aside, one case only in any family coming under my observation has occurred. This is in striking and most favorable contrast with what, as before stated, often happens in epidemic typhoid in the country, where no sewer gas or obstructed drains are to be found in explanation of this difference. The increase in the number of sewers, water-closets, and cesspools, in Philadelphia, for some years past, has been simply enormous; and consequently the opportunities for contamination of the atmosphere, water, or milk, correspondingly augmented. If (as some have asserted) sewer gas is the most potent and common cause in the production of typhoid fever, and if so large a proportion of the houses in the city are infected by it, would we not have, in a population of nearly nine hundred thousand inhabitants, cases almost without number, and deaths in proportion, far more than quadruple the average number reported by the Board of Health?

Physicians have long differed in opinion in reference to the conditions under which typhoid fever is likely to occur, and in regard to the influence exerted by the various agents known, or believed, to play a part in the production of this disease. While many, at the present moment, are disposed to accept the opinion that in an atmosphere contaminated by sewer gas, or effluvia arising from cesspools, or decaying animal or vegetable matter, is to be found the ostensible cause of the disease; others are more disposed to refer it to the use of milk or water infected by the agents just named, and, in addition, to the consumption of food partially decayed. On the other hand, there are those who, whilst admitting the possibility or probability

that certain limited outbreaks of typhoid may be referred to the local causes just named, are fully convinced that the widely spread and fatal epidemics witnessed at times in the country can be explained by no such agencies as those alluded to; neither do we think that a practitioner, who has had the experience of a single season of epidemic typhoid fever in the country, can refer to these agents as the cause of such epidemic, without rejecting the evidence of his own senses.

Dr. James Jackson, of Boston, long before Pettenkoffer, in explanation of certain erratic and very restricted outbreaks of typhoid fever, ventured to suggest that, in the absence of any visible agency, some emanation from the soil, obscure as to origin, might account for them. Pettenkoffer, however, determined that in proportion to the elevation or depression of the water level in the earth was the greater or less prevalence of typhoid fever, without fixing any limit as to the extent of its influence. When we call to mind that, as before stated, a hot, dry summer is, as a rule, the precursor of an unusual amount of fever, either remittent or typhoid, the view of Pettenkoffer demands attention and earnest consideration; for, after laborious and protracted researches, he announces, definitely, that in proportion as the water level becomes lower, typhoid fever increases. That many epidemics of the fever appear without the possibility of assigning any special cause in explanation of their origin, is manifest, and no one is more prepared to admit this than the practitioner and medical writer of large experience. Whatever may be the cause or causes of the fever, when once established,

contagion, especially when aided by the concurrence of certain indefinable, elemental, and local influences, lends its all-powerful aid in its extension; this, at least, is the opinion of Bretonneau, Trousseau, Louis, Gendron, Chomel, and many other investigators of the disease in France, England, and the United States; among the latter, Drs. Nathan Smith, James Jackson, Elisha Bartlett, and Austin Flint, Sr.

Of the writers quoted, nearly all recognize that very frequently the disease arises spontaneously, and, while some of them admit that a limited number of cases may be due to emanations from sewers or cess-pools, others, regarding typhoid fever as specific in character, claim that a specific cause is necessary to develop the disease; and that they find no sufficient evidence of such cause either in the respiration of the effluvia alluded to, or in the consumption of unwholesome food. Trousseau, the medical genius of France, declares "that in Paris, or other large centres of population, it is impossible to determine the origin of the malady; and that this can only be done by physicians who practise in limited spheres, when it can generally be ascertained where the first attack of the disease was noticed." Than this, nothing could be more certain in relation to contagious disease in general; for in the street car may be seated by your side the washerwoman, whose bundle upon her lap may contain the clothing of a patient affected with a malignant disease.

When, from time to time, on meeting with physicians of this city who have formerly practised in the country, the inquiry has been made as to the origin of typhoid fever, the answer has been, without excep-



tion, that only in an occasional case could even a hypothetical local cause be assigned. The late Dr. Gallagher, of West Philadelphia, once informed me that, from 1839 to 1842, he was nearly broken down in attending to cases of typhoid fever occurring in the fine rural section four or five miles west of this city. If typhoid is a specific fever, and has as a definite, specific cause, sewer gas, what can be said in explanation of its great prevalence and fatality at the distance of a few miles only from the city, where no sewer gas exists? All writers and practitioners, however, do not accept *in toto*, perhaps not at all, the sewer gas theory; but on the contrary refer to the emanations from decomposed vegetable and animal substances, and from cesspools, as frequent sources of the disease; in addition to which, a third class of observers insist that food, liquid or solid, contaminated by these agents, must be taken into account before a solution of the grand problem, the causation of typhoid fever, can be accomplished. But these various hypothetical or assumed causes, have been for years under serious and earnest consideration, yet, so far from solving the difficulty, we are, in many respects, little further advanced than when Montaigne, three centuries ago, in his amusingly furious tirade against doctors and their prescriptions, said, quoting the language of Pliny: "That the most important science in use with us, that which has our preservation and our health in charge, is unfortunately the most uncertain, confused, and disturbed by the most frequent changes," and then, giving utterance to his own thoughts, exclaimed: "There is no great danger of our being mistaken as to the altitude of the sun,

or in the fraction of an astronomical calculation, but here, where it concerns our very existence, it is not wisdom to expose ourselves to the mercy of so many contrary and agitated winds.”<sup>1</sup>

Attempts have often been made to explain away the difficulty of accounting for the extraordinary prevalence and fatality of typhoid fever in the country, as compared with the city, by alleging that the water is, probably, contaminated by the well being too near to where is located the family necessitude, or otherwise that the drainage is from the latter to the former. Again, it is said that the effluvia, arising from decayed vegetable matter stowed away in vaults or cellars, are a fruitful source of the disease. That such a condition of things may obtain among families in some of the manufacturing towns of England, or other places in Europe, or in certain localities of this country, may be granted; but that it characterizes any considerable portion of the rural sections that have come under my own notice cannot, in truth, be admitted; and certainly the charge of negligence and improvidence, implied in the above allegation, can have no application to the circle of my former practice in the country, nor to the region adjacent.

A most significant reference must here have place. At the distance of three miles from my location was situated, upon the Brandywine, the cotton factory of

<sup>1</sup> “Que la science la plus importante qui soit en nostre usage, comme celle qui a charge de nostre conservation et santé, c'est, de malheur, la plus incertaine, la plus trouble, et agitée de plus de changements.” Il n'y a pas grand dangier de nous mescompter à la haulteur du soleil, ou en la fraction de quelque supputation astronomique: mais ici, où il y va de tout nostre estre, ce n'est pas sagesse de nous abandonner à la mercy de l'agitation de tant de vents contraires.”—Montaigne, *Essais*, Liv. 2, chap. 37, Paris, 1834.

Mr. Wm. Young, employing a large number of hands, of whom probably at least one-half were under my care; and yet, so far as memory serves, only two cases of typhoid fever there, ever came under my charge. At the distance of about a mile below are located the immense establishments of the Messrs. Dupont, where thousands of people live in comparative proximity. As my practice did not extend to these works, a note was sent a few weeks ago to Mr. Henry Dupont, asking whether or not typhoid fever prevailed among his employés during the years 1840-1843. The note of Mr. Dupont in reply states that, while of so distant a period his recollection is not clear, his impression is that there were but few cases of typhoid fever at that time among the people, and that they are generally healthy. A note recently received from Dr. Jos. P. Chandler, of Centreville, who has had an extraordinary opportunity of investigating the disease, confirms the impression of Mr. Dupont, as he is well qualified to do, from the large practice he has had at the works.

Dr. Chandler also informs me that, with the exception of a few cases of the fever, where it seemed probable that local causes may have given rise to the disease, the rule has held good that its origin is involved in obscurity. This statement is fully justified in the fact that the manufacturing centres, with their closely situated houses, do not suffer, as his letter informs me, in comparison with the rural sections, where the disease will often appear in the best and most favorably situated dwellings, with nothing within or without to explain the cause. Now when we call to mind that, in some seasons, typhoid fever has prevailed exten-



sively on the north and south side of the Brandywine, whilst the intermediate banks, with their dense population, have suffered but little, is it not worth while to concede, at least, to such a statement, so full of truth and meaning, that measure of thoughtful consideration which its importance merits, and in fact demands? At the present moment, and during the last two or three months, Wilmington has suffered from an unusual amount of typhoid, yet the banks of Brandywine have had but few cases; and whilst the proverbial generosity of the Messrs. Dupont never flags, when the safety, the health, or the general welfare of their employés is in question, the fact is nevertheless obvious, that the local conditions must, of necessity, be in several points such as in the opinion of many physicians would surely engender an epidemic of typhoid fever, which yet for a long series of years has not occurred.

In the earlier part of this paper, it was stated that the reports of the Board of Health of this city did not warrant the anxiety and alarm that exist in relation to sewer gas, as the chief agent in the production of typhoid fever; and without going into details, a few points only will be adduced in reference to this matter. The reports show that very often the deaths from this disease are more numerous in the winter months than during the hot weather of the summer. For example, in January, February, and December, of 1878, the deaths in the order named, were 34, 32, and 33, whilst in July the deaths were but 23; yet this month, as shown by the record of the last ten years, is the hottest of the year, and consequently is the period when fermentation, decomposition, and putrefaction are most

actively engaged in evolving effluvia from animal or vegetable substances. This record of facts and figures may, by some, be regarded as inconceivable and perplexing, yet it finds its counterpart in the country, where during one entire winter the disease was unusually prevalent and fatal. Incidentally, it may here be stated that Dr. L. P. Bush, of Wilmington, during that winter, made, at my request, the examination of the body of a young man who died, apparently from perforation, and this was verified by his careful *post-mortem* search. To Dr. Bush, in fact, was I first indebted for the intimation that Dr. J. P. Chandler and myself were probably having to do not any longer with remittent, but with typhoid, fever, for his attention had, if I remember, been especially drawn to this change of type by Dr. Wm. W. Gerhard, and the work of Dr. Elisha Bartlett.

Quoting again, after this digression, from the Health Office Reports, we find that in a series of years the weekly deaths from typhoid average but six or eight in a population of nearly nine hundred thousand; and it should be remembered that this includes the deaths in the almshouses, prison, penitentiary, hospitals, house of correction, and all other similar establishments, making at least one-fifth to be deducted from the total reported.

It is only a few weeks ago that, of our vast population, only two deaths from typhoid were reported for the week. When we reflect upon the number of inlets constantly evolving gas, at times very offensive; the thousands of residences, factories, etc., infected with it; the throngs of plumbers and gas-fitters who are daily compelled by their vocation to inhale the

gas in no diluted form ; is there not cause of rejoicing, rather than of the alarm that prompts to invert a tumbler over a small aperture, or fill a slight crevice in the washstand, with paper or cotton? Quite recently there appeared in the daily papers an account of an excursion through one of the immense sewers of Paris, where the odor is said to be so offensive that it can never be forgotten. Is it not strange that this should be permitted if sewer gas was there regarded as the chief and common cause of typhoid fever? But sewer gas is also said by many to be the general cause of diphtheria and scarlet fever. By reference to the New York Board of Health Report, for the week ending January 11, 1879, it appears that 274 cases of scarlet fever, and 65 of diphtheria, were returned, and only 8 of typhoid fever; nevertheless, the logical inference deducible from this statement will probably be contested. The deaths from scarlet fever, for the month ending Dec. 28, 1878, were, by the same report, 228, from diphtheria 101, from typhoid fever 24, showing a fair correspondence with the number of cases returned.

My own experience, and that of most physicians who have had much experience in typhoid fever, shows a larger number of cases and deaths among males than females; yet the latter, more domestic in town or country than the former, are far more exposed to the influence of what are now regarded by many as the almost exclusive agents in the production of the disease. Practitioners and writers are generally in accord that the disease is most common between the ages of fifteen and thirty-five years; it will be found, however, that a very large proportion are between seventeen



and twenty-one years, the most fatal too of all periods, especially when the patient is large and has grown up rapidly ; and it is just at this time that young men are prone to out-door life, even when business does not call.

The readiness of some physicians to attribute to sewer gas an attack of typhoid, if any smell denoting its presence in a house can be detected, is surprising, when every physician knows that this is only an exceptional event. To get over this difficulty it is now declared in some quarters that, although the smell be wanting, the gas is present, and capable of producing an attack. This is an unfortunate discovery, if it be a discovery ; for it would follow from this, that, after much expense in the effort to banish gas where it was known to exist, from the sense of smell, it might still remain, although imperceptible, and keep the family in painful suspense. But have we any tangible and conclusive proof of this lurking, unforeseen danger, and, if it really exist, is it not remarkable that in the thousands of houses, where the odor is annoyingly perceptible, it appears to do so little mischief? Yet after all there is consolation and hope for the people ; for it is announced that typhoid fever and, as may be supposed, with it, diphtheria and scarlet fever, can be stamped out. The whole system of existing sewerage is now discovered to be radically wrong, and it is declared that it ought to be torn out, root and branch. In this announcement the dishonest contractor would surely have the largest share of hope and consolation, were it not that a lynx-eyed, intelligent, and fearless Reform Association confronted him. To this association, in fact, are due the thanks of the community

for having unearthed the nefarious acts of more than one contractor, and exposed to the light of day the wretched workmanship and worse material, that they fully believed had been forever concealed from human vision. Let the actual system, then, have justice done it, in material and construction, before entering upon the trial of another, involving the expenditure of untold millions still further to oppress the renter and tax-payer.

But what is to become of the rural population who, without sewer gas, suffer more from epidemic typhoid fever than the residents of cities? Let them, we shall be told, be more careful in regard to local filth, contaminating both air and water or food. This advice appears to be tendered in all sincerity and charity; but whether the people of any well-ordered farming district in the counties adjacent to the city, where the Quaker element, proverbial for neatness and order, so largely prevails, will receive, with due humility and gratitude, the advice so generously proffered, remains to be seen. Admitting, however, that the charge is in some instances well founded, or indeed that every farm-house in the largest county adjacent to Philadelphia has, within or without, the sources of infection, what would it all amount to, diffused over so large an area, when compared to the limited space on which the city is built, with its sewers, water-closets and cess-pools, aggregating, in number, tens of thousands, and many of the latter, too, in close proximity to the dwelling, in an offensive condition, and rendered more so by serving as receptacles for every description of putrefied and putrefactive substance? And, again, has the butcher never any unsalable, perhaps semi-

putrefied, meat on hand? has the green-grocer no decayed vegetables or fruits to dispose of? and have the hucksters nothing of a semi-putrid character to stow away, in barrels or boxes, in cellars or vaults, or to have covered up from sight in a filthy stable-yard or outhouse?

The sources, then, of local contamination would seem to be infinitely more numerous in the city than in the country, yet without discouraging those who promise to stamp out disease. The real difficulty is when an epidemic of a violent and extended character starts up, as it has been known to do, in certain mountainous parts of Virginia and Tennessee, in their almost pristine condition, without the semblance of filth to account for its origin. It is evident then that, whatever cases of typhoid fever may have been traced to sewer-gas or local contamination, some other cause or causes must be sought to account for the frequent and disastrous outbreaks in the rural sections; and this, it is clear, was in the mind of that sagacious observer and logical thinker, Dr. Charles Murchison, when he declared his belief in the origin *de novo* of typhoid fever, placing himself, in this point, upon the platform occupied by all the celebrities named in the earlier part of this paper.

Directing our attention once more to the health of our city, as exhibited by the Board of Health from week to week, we see no rational cause for anxiety or alarm; for while the deaths from pneumonia, for the last five weeks, have been very numerous, exceeding by far the total number caused by typhoid fever, diphtheria and scarlatina, taken together, the city, as to general health, may still be, as it has been for many



long years, regarded as one of the most healthy of large cities. In the present Board of Health the people, we believe, may have entire confidence, composed as it is of gentlemen of exalted character, and fully interested in the important and responsible work they have in charge; presided over, too, by a gentleman whose fitness for the post he occupies is acknowledged by every one who has examined the recent annual reports, in the preparation of which he is doubtless aided by the indefatigable Registrar. That nothing will be left undue by the Board for the prevention of disease, so far as that is possible, and for the removal of nuisances, even if not productive of disease, we have full confidence. The circulation of exaggerated reports, in relation to any disease, should be avoided, as the tendency is to engender a degree of anxiety and inquietude, whose only effect is to diminish vital force, and thereby render the system more liable to the influence of a deleterious agent.







